Alaska Energy Statistics

1960-2009

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in collaboration with

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INTRODUCTION

This report has had various publishers. Before 1985, the federal Alaska Power Administration published *Alaska Electric Power Statistics*. Then, the Alaska Energy Authority (formerly the Alaska Power Authority) began gathering statistical data and publishing this annual report. In 1988, the *Alaska Electric Power Statistics* report became a combined effort of the Alaska Systems Coordinating Council and the Alaska Energy Authority. Beginning in 1993, the report became a joint effort of the Alaska Systems Coordinating Council and the Alaska Department of Community and Regional Affairs, Division of Energy. After the 1995 report, no reports were issued until 2003, when the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage (UAA), published a report, with funding from the Alaska Energy Authority (AEA), the Regulatory Commission of Alaska (RCA), and the Denali Commission.

ISER prepared this twenty-fourth edition of the *Alaska Electric Energy Statistics* in collaboration with the Alaska Energy Authority. Unlike previous reports, data tables are presented solely in digital form in an MS Excel file. The workbook containing the data tables is available on the ISER website at http://iser.uaa.alaska.edu/Publications/AlaskaEnergyStatisticsCY2009Tables.xlsx) and the AEA website (http://www.akenergyauthority.org/).The data tables are presented in a dataset format for convenient use and manipulation. All data presented are identified by the geographic regions used in previous Alaska Electric Energy Statistics,[1] as well as AEA energy regions, Alaska Native corporation regions, and census areas. The data tables available in the workbook are:

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[1] The regions are: Arctic Northwest, South Central, South East, South West and Yukon.

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The report provides a brief introduction, highlights, and summary tables only. The summary tables use the AEA *Energy Pathway* publication regions. There are several appendixes. Appendix A is a glossary of terms; B has maps showing the energy regions; C lists data sources; and D cites reporting requirements.

The 2008 edition, published in May 2011, includes tables reporting military and industrial generation. This 2009 report does not contain that information, because not all data are currently available. We gathered information on utility electricity capacity, generation, and other characteristics from reports filed with the U.S. Department of Energy's Energy Information Administration (EIA) and made available on the agency's website; from data collected by the Alaska Energy Authority through the Power Cost Equalization (PCE) program; and from a limited number of direct contacts with electric power producers. This is a similar methodology used to develop information for the 2003 and 2008 reports.

All utilities with installed capacity greater than one megawatt are required by law to report their operations to the federal government. A number of utilities in Alaska fall below that threshold. Information for these smaller utilities came primarily from the PCE program. The installed capacity table (Table 2.1a in the Excel workbook) includes all utilities for which data are available. Also, in many parts of the state, there are no utilities producing electricity, and all electricity is self-generated at small installations. There are a large number of such installations (for example, Point Baker, Port Protection, and Telida); it would be very expensive to identify and contact each one individually.

Keep in mind that this publication is meant as a general reference and broad overview of electric power in Alaska. Because data come from various sources and have imperfections, the reader may find inconsistencies across tables. For example, Table 2.5b shows average rate per kilowatt-hour as calculated using the reported revenue, sales, and customers; Table 2.5c shows average rate per kilowatt hour as reported by the utility to the PCE program; these two rates are sometimes slightly different.[2] Data in different tables may include different cases, or may be guided by slightly different concept definitions, depending on the source. Still, we believe the information presented provides a reasonable and valuable overview of electric power and energy across Alaska.

[2] Only for PCE communities. Communities for which the data source is EIA report the same calculated rate as in Table 2.5b.

SUMMARY AND HIGHLIGHTS

The purpose of this report is to present electric power reference data for Alaska; it is not intended to provide detailed analysis of energy production, consumption or uses. Nevertheless, this section highlights information that may be of particular interest to the reader.

Scope of Report

The Alaska Energy Authority and the Institute of Social and Economic Research at the University of Alaska Anchorage prepared this report, which primarily presents 2009 data on electricity produced by utilities in Alaska, including summary and detailed tables showing:

- Installed capacity by:
  - type of utility,
  - prime mover
  - plant
- Fuel
  - use
  - cost
  - CO_2 emissions
- Net generation:
  - type of utility
  - prime mover
  - fuel type
- Utility
  - sales
  - revenue
  - customers
    - average annual electricity use
    - average annual electricity price

Electricity Generation and Cost

- As of 2009, Alaska had about 2,178 megawatts of utility installed capacity that generated about 6.4 million megawatt-hours of electricity.
- Electricity generated by natural gas statewide decreased from 61% in 2008 to 55% in 2009. The share from hydroelectric power increased from 17% in 2008 to 20% in 2009; generation from oil products increased from 16% to 18%; and the share from coal increased from 6% to 7%. Generation from wind remained less than 1%, at about 0.14% statewide.
- Sources of power generation vary sharply by region. The Railbelt region has most of the state's population and uses most—about 80%—of the electricity. Natural gas is used to generate most of the electricity for the Railbelt, but the region also has hydropower.
- Many but not all communities in Southeast Alaska get electricity from hydropower; some rely on diesel.
- Rural communities in Western and Interior Alaska rely mostly on diesel to generate electricity, but wind power is being added in a growing number of rural places, financed largely by the state's Renewable Energy Fund. About 80% of wind-power capacity has been added since 2008, and the amount of electricity generated by wind annually increased almost three-fold in 2009.
- Wood generated heat in 2009 in community-level thermal facilities in about ten communities, mostly in Southeast, where wood resources are abundant.
- The average annual residential use of electricity statewide in 2009 was about 7,660 kilowatt-hours—but that ranged from around 1,500 kilowatt-hours in places where electricity is most expensive to more than 15,000 where it is cheapest. Nationwide, average annual use is about 11,000 kilowatt-hours.

- Communities in Southeast Alaska that rely primarily on hydroelectric power to generate electricity have the lowest rates —as little as 9 cents per kilowatt-hour in 2009. Residents of Anchorage and other places in Southcentral Alaska that rely mostly on natural gas for generation paid around 15 cents per kilowatt-hour in 2009. Alaskans in small remote rural places that rely on diesel have the most expensive electricity—from roughly 50 cents per kilowatt-hour to more than $1 in 2009. The state helps reduce the price of electricity in most of those remote rural communities through its Power Cost Equalization program, but electric bills still remain much higher in remote rural areas than in urban communities.

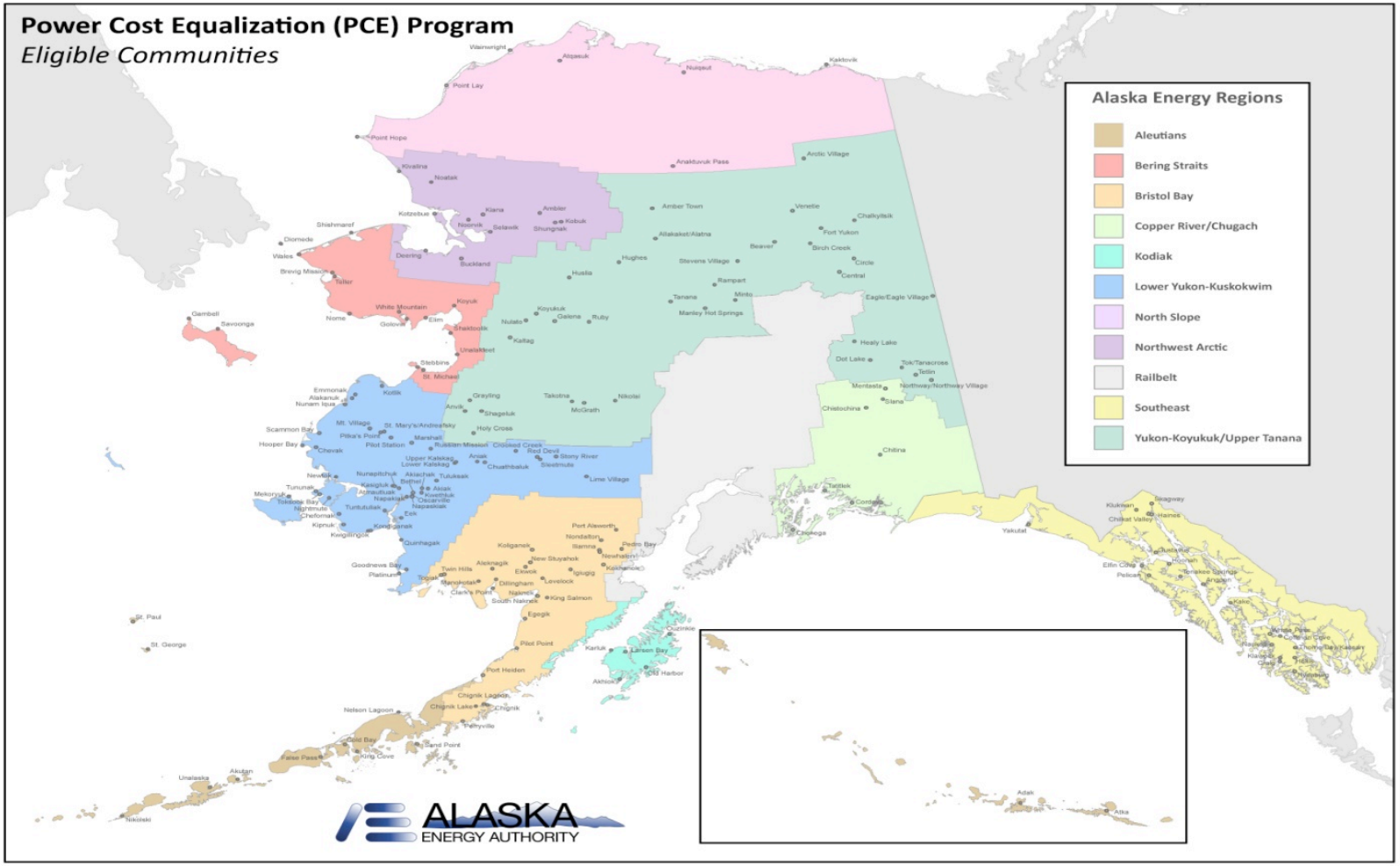
ELECTRIC UTILITIES SUMMARY TABLES

Table 1.a Utilities Participating in Power Cost Equalization Program, 2009 By AEA Energy Regions

AEA Energy Region	Yes	Inactive	No	Total	Percent Active in PCE program
Aleutians	12	1		13	92%
Bering Straits	16			16	100%
Bristol Bay	21	1		22	95%
Copper River/Chugach	6		2	8	75%
Kodiak	4	1	1	6	67%
Lower Yukon-Kuskokwim	46			46	100%
North Slope	7		1	8	88%
Northwest Arctic	11			11	100%
Railbelt			6	6	0%
Southeast	21		9	30	70%
Yukon-Koyukuk/Upper Tanana	34	3	2	39	87%
Total	**178**	**6**	**21**	**205**	**87%**

Note: For utilities that serve many communities with no grid such as AVEC and AP&T, each community is counted as a separate utility.

Figure 1. PCE Eligible Communities



Fay, Ginny, Alejandra Villalobos Meléndez and Amber Converse, 2011, *Alaska Energy Statistics*, 1960-2009, prepared for the Alaska Energy Authority, September 2011

Table 1.b Installed Capacity (kW), 2009
By AEA Energy Regions

AEA Energy Region	Total	Percent of Total
Aleutians	24,245	1%
Bering Straits	37,239	2%
Bristol Bay	27,571	1%
Copper River/Chugach	53,455	2%
Kodiak	63,056	3%
Lower Yukon-Kuskokwim	49,752	2%
North Slope	40,600	2%
Northwest Arctic	32,042	1%
Railbelt	1,411,500	65%
Southeast	409,983	19%
Yukon-Koyukuk/Upper Tanana	28,884	1%
Total	**2,178,327**	**100%**

Compared with 2008, the 2009 installed capacity was stable, without significant growth. The exception was wind installed capacity, which almost tripled—from 2,174 kW in 2008 to 7,884 kW in 2009. But wind still accounts for less than half of one percent of the total installed capacity in Alaska. In 2009:

- Railbelt hydroelectric installed capacity was 13% of the Railbelt total
- Hydroelectric installed capacity was 20% of the statewide total
- Railbelt total installed capacity was 65% of the statewide total

Railbelt Hydroelectric: 190MW
Railbelt Total: 1,412 MW

Alaska Hydroelectric: 441MW
Alaska Total: 2,178 MW

Table 1.c Net Generation (MWh), 2009
By AEA Energy Regions

AEA Energy Region	Total	Percent of Total
Aleutians	49,982	1%
Bering Straits	56,747	1%
Bristol Bay	53,840	1%
Copper River/Chugach	99,441	2%
Kodiak	127,786	2%
Lower Yukon-Kuskokwim	94,420	1%
North Slope	82,679	1%
Northwest Arctic	36,584	1%
Railbelt	5,057,740	79%
Southeast	744,327	12%
Yukon-Koyukuk/Upper Tanana	37,844	1%
Total	**6,441,391**	**100%**

Compared with 2008, total net generation in 2009 remained stable without significant change, except for power generated by wind, which tripled from 2,246 MWh in 2008 to 9,152 MWh in 2009. But wind accounts for less than half of one percent of total power generation in the state.

- Railbelt hydroelectric generation in 2009 was 9% of the Railbelt total, increasing from 7% in 2008.
- Hydroelectric generation was 20% of the statewide total, increasing from 17% in 2008.
- Railbelt total generation was 79% of the statewide total, with no change from 2008.

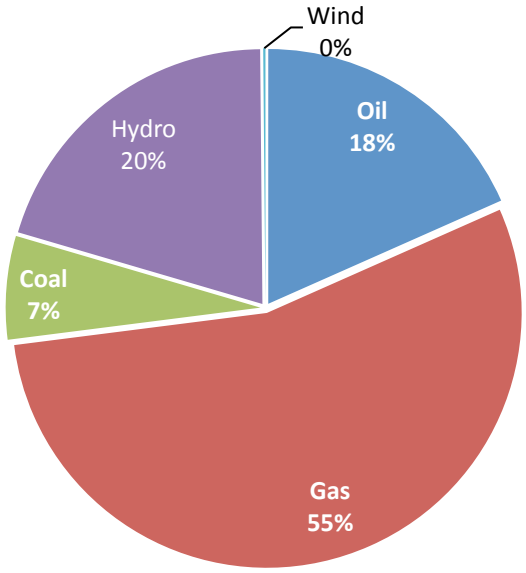
Railbelt Hydroelectric: 452,611 MWh
Railbelt Total: 5,057,740 MWh

Alaska Hydroelectric: 1,308,656 MWh
Alaska Total: 6,441,391 MWh

Table 1.d Net Generation by Fuel Type (MWh), 2009
By AEA Energy Regions

AEA Energy Region	Oil	Gas	Coal	Hydro	Wind	Total
Aleutians	47,960			2,022		49,982
Bering Straits	56,244				503	56,747
Bristol Bay	51,308			2,500	32	53,840
Copper River/Chugach	39,390			60,050		99,441
Kodiak	22,562			99,086	6,138	127,786
Lower Yukon-Kuskokwim	92,918				1,502	94,420
North Slope	30,122	52,557				82,679
Northwest Arctic	35,607				977	36,584
Railbelt	716,809	3,465,997	422,323	452,611		5,057,740
Southeast	51,940			692,387		744,327
Yukon-Koyukuk/ Upper Tanana	37,844					37,844
Total	**1,182,705**	**3,518,554**	**422,323**	**1,308,657**	**9,152**	**6,441,391**

Figure 2. Alaska Utilities Net Generation by Fuel Type, 2009



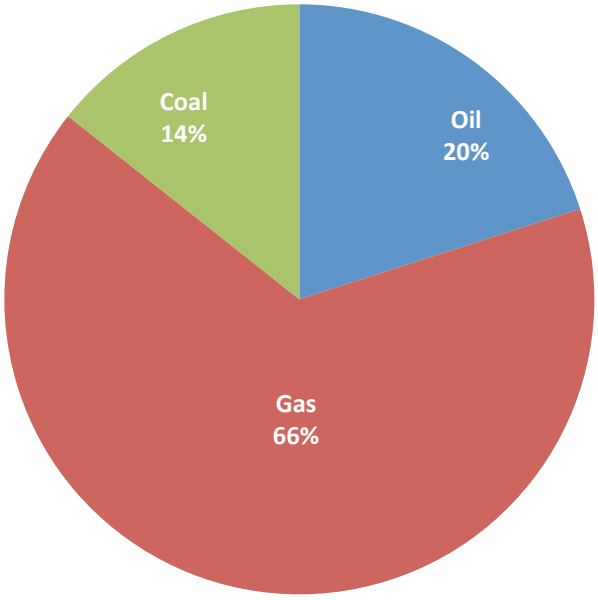
Fay, Ginny, Alejandra Villalobos Meléndez and Amber Converse, 2011, *Alaska Energy Statistics*, 1960-2009, prepared for the Alaska Energy Authority, September 2011

Table 1.e Fuel Use for Power Generation, 2009
By AEA Energy Regions

AEA Energy Region	Oil	Gas	Coal
	(Barrels)	(Mcf)	(Short Tons)
Aleutians	84,964		
Bering Straits	90,336		
Bristol Bay	87,280		
Copper River/Chugach	78,384		
Kodiak	38,892		
Lower Yukon-Kuskokwim	168,040		
North Slope	56,725	779,209	
Northwest Arctic	59,774		
Railbelt	1,207,233	37,299,122	436,549
Southeast	106,177		
Yukon-Koyukuk/Upper Tanana	69,353		
Total (Physical Units)	**2,047,157**	**38,078,331**	**436,549**
Conversion Factor	5.825	1.025	19.536
Total MMBtu	**11,924,691**	**39,030,289**	**8,528,421**

The fossil fuel most used for electricity generation in Alaska is natural gas, though it is only available in the Railbelt and some communities on the North Slope. Natural gas accounted for 66% of fossil fuels consumed by utilities for power generation in 2009. Diesel is the second most used fossil fuel for power generation, but it accounts for only 20% of fuel used statewide. The Railbelt region consumed most—about 59%—of the diesel utilities used for power generation in 2009, mostly for stand-by units. The Lower Yukon-Kuskokwim region was next, using about 8% of the diesel consumed statewide. Coal made up 14% of the fossil fuels used in 2009; it is used only in the Railbelt region, specifically in the Fairbanks area, where there is a convenient local supply. In 2009, burning from all fossil fuels used for generating power produced about 3.8 million metric tons of carbon dioxide statewide.

Figure 3. Distribution of Fuel Used by Utilities for Power Generation in Alaska



**Distribution based on MMBtu energy equivalent units.*

Figure 4. Barrels of Oil Used for Electricity Generation by Utilities, by Energy Regions

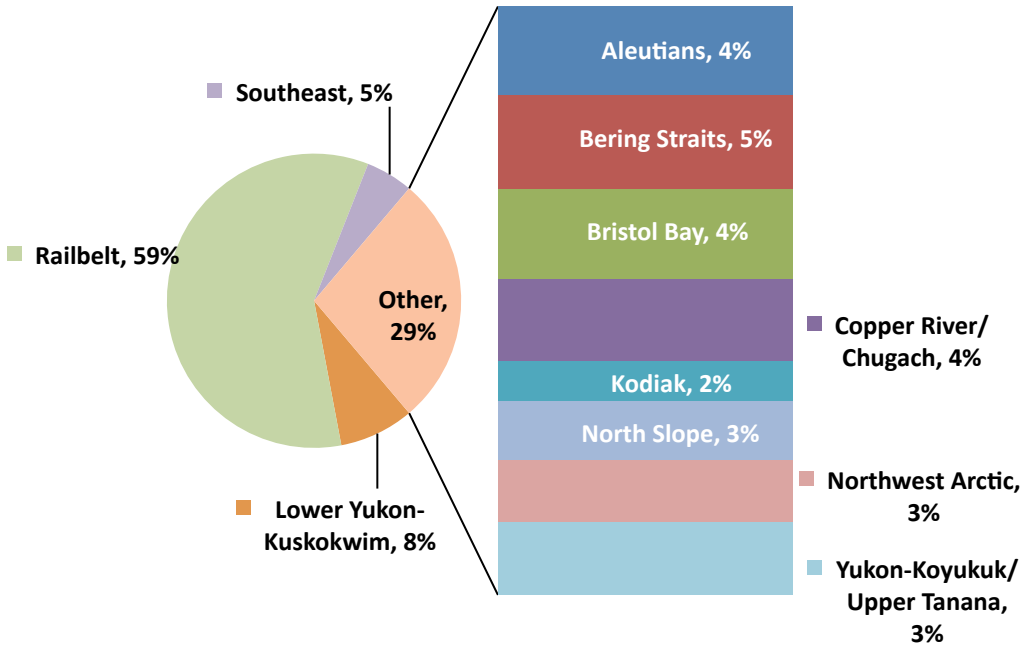


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Table 1.f Sales (MWh), 2009
By AEA Energy Regions

AEA Energy Region	Residential	Commercial	Other[3]	Total	Percent of Total
Aleutians	8,520	33,134	10,601	52,255	1%
Bering Straits	17,389	22,240	13,196	52,825	1%
Bristol Bay	14,890	24,031	11,276	50,197	1%
Copper River/Chugach	23,294	63,173	4,533	91,000	1%
Kodiak	34,243	101,951	536	136,731	2%
Lower Yukon-Kuskokwim	30,907	35,027	20,693	86,627	1%
North Slope	16,086	104,990	1,583	122,659	2%
Northwest Arctic	13,122	12,934	8,809	34,866	1%
Railbelt	1,638,612	3,209,335	-	4,847,947	77%
Southeast	314,624	433,356	31,146	779,126	12%
Yukon-Koyukuk/Upper Tanana	12,060	9,892	10,935	32,886	1%
Total	**2,123,746**	**4,050,064**	**113,309**	**6,287,119**	**100%**
Percent of Total	**34%**	**64%**	**2%**		

Compared with 2008, electricity sales were relatively unchanged in 2009. Sales across energy regions also changed little. As expected, most of the power sales were in the Railbelt region. The Southeast and Railbelt regions had the highest annual average use per residential customer, at about 9,890 kWh and 7832 kWh, respectively. The Yukon-Koyukuk/Upper Tanana and Bristol Bay regions had the lowest annual average use per residential customer, at about 3,805 kWh and 4,718 kWh, respectively.

Most of the electricity produced in Alaska, about 64%, is sold to commercial customers. The North Slope and Railbelt regions had the highest annual average use per commercial customer, at about 129,557 kWh and 106,499 kWh, respectively. The Yukon-Koyukuk/Upper Tanana and Lower Yukon-Kuskokwim regions had the lowest annual average use per commercial customer, at about 13,081 kWh and 21,462 kWh, respectively.

[3] Other includes sales to community, governmental facilities and others.

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Table 1.g Revenue ($000), 2009
By AEA Energy Regions

AEA Energy Region	Residential	Commercial	Other	Total	Percent of Total
Aleutians	3,436	11,838	4,732	20,006	2%
Bering Straits	8,203	9,304	6,354	23,861	2%
Bristol Bay	7,384	11,223	5,549	24,156	3%
Copper River/Chugach	5,927	14,815	1,619	22,361	2%
Kodiak	5,919	15,448	267	21,633	2%
Lower Yukon-Kuskokwim	17,953	18,750	12,174	48,877	5%
North Slope	2,244	13,453	266	15,963	2%
Northwest Arctic	7,406	6,781	5,374	19,561	2%
Railbelt	263,681	398,466	-	662,147	69%
Southeast	37,872	45,603	5,300	88,776	9%
Yukon-Koyukuk/Upper Tanana	6,303	5,294	5,805	17,402	2%
Total	**366,329**	**550,974**	**47,441**	**964,743**	**100%**
Percent of Total	**38%**	**57%**	**5%**		

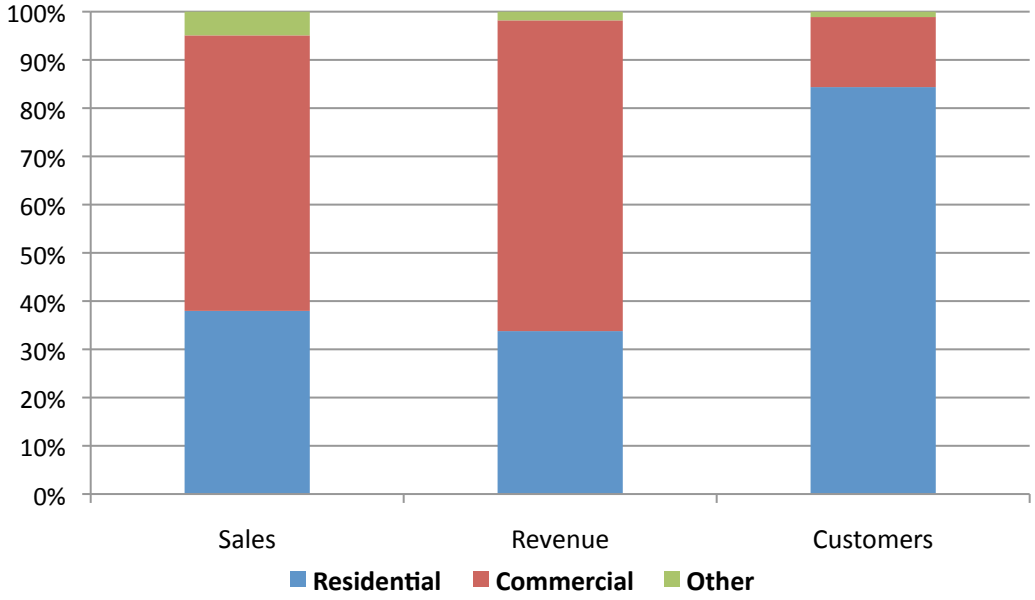
Compared with 2008, revenue from electricity sales increased about two percentage points. Distribution of revenues across energy regions saw no significant change. The Northwest Arctic region had the highest average revenue per residential customer in 2009, at about $3,817; followed by the Lower Yukon-Kuskokwim region, which averaged about $2,864. The North Slope region had the lowest average revenue per residential customer, at about $1,063, followed by the Southeast region, which averaged about $1,190. Overall 57% of the revenues from electricity sales came from the commercial sector, because of that sector's higher use (64% of sales, Table 1e).

Table 1.h Customers (Accounts), 2009
By AEA Energy Regions

AEA Energy Region	Residential	Commercial	Other	Total	Percent of Total
Aleutians	1,610	664	345	2,618	1%
Bering Straits	3,362	501	405	4,268	1%
Bristol Bay	3,156	1,023	533	4,711	1%
Copper River/Chugach	3,972	1,427	152	5,551	2%
Kodiak	4,890	1,231	38	6,159	2%
Lower Yukon-Kuskokwim	6,269	1,632	729	8,630	3%
North Slope	2,112	810	45	2,967	1%
Northwest Arctic	1,940	228	246	2,414	1%
Railbelt	209,217	30,135	-	239,352	74%
Southeast	31,813	8,330	591	40,733	13%
Yukon-Koyukuk/Upper Tanana	3,169	756	509	4,435	1%
Total	**271,510**	**46,736**	**3,592**	**321,838**	**100%**
Percent of Total	**84%**	**15%**	**1%**		

As expected, the regions with the most customer accounts were the Railbelt and Southeast. All other regions accounted for only 13% of total power customers. There were no significant changes in the number of customer accounts, or regional distribution, between 2008 and 2009. Residential accounts made up most of the power customers in the state in 2009, about 83%. Figure 5 shows in detail the distribution of utility sales, revenue, and customers by customer type.

Figure 5. Distribution of Utility Sales, Revenue and Customers by Customer Type



Fay, Ginny, Alejandra Villalobos Meléndez and Amber Converse, 2011, *Alaska Energy Statistics*, 1960-2009, prepared for the Alaska Energy Authority, September 2011

Appendix A. Glossary of Terms[4]

Alaska Energy Authority (AEA): A public corporation of the state with a separate and independent legal existence with the mission to construct, finance, and operate power projects and facilities that utilize Alaska's natural resources to produce electricity and heat. http://www.akenergyauthority.org/

Auxiliary Generator: A generator at the electric plant site that provides power for the operation of the electrical generating equipment itself, including related demands such as plant lighting, during periods when the electric plant is not operating and power is unavailable from the grid. A black start generator used to start main central station generators is considered to be an auxiliary generator.

Backup (Standby) Generator: A generator that is used only for test purposes, or in the event of an emergency, such as a shortage of power needed to meet customer load requirements.

Barrel (bbl): A unit of volume equal to 42 U.S. gallons.

Bituminous coal: A dense coal, usually black, sometimes dark brown, often with well-defined bands of bright and dull material, used primarily as fuel in steam-electric power generation, with substantial quantities also used for heat and power applications in manufacturing and to make coke. Bituminous coal is the most abundant coal in active U.S. mining regions. Its moisture content usually is less than 20%. The heat content of bituminous coal ranges from 21 to 30 million BTU per ton on a moist, mineral-matter-free basis. The heat content of bituminous coal consumed in the United States averages 24 million BTU per ton, on the as-received basis (i.e. containing both inherent moisture and mineral matter).

British Thermal Unit: The British thermal unit (BTU or Btu) is a traditional unit of energy equal to about 1.06 kilojoules. It is approximately the amount of energy needed to heat 1 pound (0.454 kg) of water1 °F (0.556 °C). It is used in the power, steam generation, heating and air conditioning industries. In North America, the term "BTU" is used to describe the heat value (energy content) of fuels, and also to describe the power of heating and cooling systems. When used as a unit of power, BTU per hour (BTU/h) is the correct unit, though this is often abbreviated to just "BTU".

Capital Cost: The cost of field development, plant construction, and the equipment required for industry operations.

[4] U.S. Energy Information Administration glossary posted at www.eia.doe.gov/ plus multiple sources for additional Alaska specific terms.

Climate Change: A term used to refer to all forms of climatic inconsistency, but especially to significant change from one prevailing climatic condition to another. In some cases, "climate change" has been used synonymously with the term "global warming"; scientists, however, tend to use the term in a wider sense inclusive of natural changes in climate, including climatic cooling.

Coal: A readily combustible black or brownish-black rock whose composition, including inherent moisture, consists of more than 50% by weight and more than 70% by volume of carbonaceous material. It is formed from plant remains that have been compacted, hardened, chemically altered, and metamorphosed by heat and pressure over geologic time. It is estimated that Alaska holds about 15% of the world's coal resources, amounting to 170 billion identified short tons. Major coal provinces include Northern Alaska, the Nenana area, Cook Inlet – Matanuska Valley, the Alaska Peninsula, and in the Gulf of Alaska and the Bering River. Alaska coals exhibit low metallic trace elements, good ash-fusion characteristics, and low nitrogen content making them favorable for meeting environmental constraints on combustion in power plants.

Cogeneration system: A system using a common energy source to produce both electricity and thermal energy for other uses, resulting in increased fuel efficiency.

Combined Cycle: An electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine in the production of electricity. This process increases the efficiency of the electric generating unit.

Combustion: Chemical oxidation accompanied by the generation of light and heat.

Commercial Sector: An energy-consuming sector that consists of service-providing facilities and equipment of businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social, or fraternal groups. The commercial sector includes institutional living quarters. It also includes sewage treatment facilities. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the activities of the above-mentioned commercial establishments.

Consumer (energy): Any individually metered dwelling, building, establishment, or location.

Diesel #1: Also known as DF1 or Jet A. Diesel #1 is commonly used as heating fuel throughout most of northern rural AK. Diesel #1 has a lower gel temperature than Diesel #2 which is sold for heating fuel in warmer climates. Diesel #1 is same fuel the refineries sell as Jet fuel (Jet A), and in many tank farms it is stored as Jet A until sold as DF1.

Diesel #2: Is commonly used throughout the US. In Alaska it is used for marine and highway diesel as well as heating fuel in warmer regions. Diesel #2 is preferred over #1 where it is warm enough as it has higher energy content.

Diesel Fuel: A fuel composed of distillates obtained in petroleum refining operation or blends of such distillates with residual oil used in motor vehicles. The boiling point and specific gravity are higher for diesel fuels than for gasoline.

Distillate Fuel Oil: A generic name for a refined petroleum product. It can refer to diesel, heating fuel or jet fuel.

Electricity: A form of energy characterized by the presence and motion of elementary charged particles generated by friction, induction, or chemical change.

Energy Balance: The difference between the total incoming and total outgoing energy. When the energy budget is balanced, the system neither gains nor loses energy.

Energy Information Agency (EIA): An independent agency within the U.S. Department of Energy that develops surveys, collects energy data, and analyzes and models energy issues. http://www.eia.doe.gov/

Exports: Shipments of goods from within the 50 States and the District of Columbia to U.S. possessions and territories or to foreign countries.

Fuel: Any material substance that can be consumed to supply heat, power, or mechanical energy. Included are petroleum, coal, and natural gas (the fossil fuels), and other consumable materials, such as uranium, biomass, and hydrogen.

Furnished without payment (power): The amount of electricity furnished by the electric utility without charge, such as a municipality under a franchise agreement or for public street and highway lighting. It does not included energy consumed by the utility.

Gallon: A volumetric measure equal to four quarts (231 cubic inches) used to measure fuel oil.

Gas: A non-solid, non-liquid combustible energy source that includes natural gas, coke-oven gas, blast-furnace gas, and refinery gas.

Grid: The layout of an electrical distribution system.

Gross Domestic Disposition: The total amount of energy available for sale in the domestic region, i.e. energy produced for sale in the domestic region in addition to energy imported for sale within the domestic region.

Gross Extraction: The total amount of fuel obtained or produced by a power production plant.

Gross Generation: The total amount of electric energy produced by generating units and measured at the generating terminal in kilowatt-hours (kWh) or megawatt hours (MWh).

Heating Degree Days (HDD): A measure of how cold a location is over a period of time relative to a base temperature, most commonly specified as 65 degrees Fahrenheit. The measure is computed for each day by subtracting the average of the day's high and low temperatures from the base temperature (65 degrees), with negative values set equal to zero. Each day's heating degree days are summed to create a heating degree day measure for a specified reference period. Heating degree days are used in energy analysis as an indicator of space heating energy requirements or use.

Hydroelectric Power: The use of flowing water to produce electrical energy.

Imports: Receipts of goods into the 50 States and the District of Columbia from U.S. possessions and territories or from foreign countries.

Industrial Sector: An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity: manufacturing, agriculture, timber harvest and wood processing, fishing and fish processing, hunting, mining, oil and gas extraction, and construction. Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. Fossil fuels are also used as raw material inputs to manufactured products. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the above-mentioned industrial activities.

Injections: Natural gas injected into storage reservoirs.

Installed Capacity: The maximum theoretical production output of a plant, based either on nameplate capacity or actual (practically determined) capacity.

Internal Combustion: The process where fuel is burned, or combusted, inside a cylinder, such as a diesel engine, producing power directly as opposed to fuel burning externally, such as in a steam engine. The term internal combustion engine usually refers to an engine in which combustion is intermittent, such as the more familiar four-stroke and two-stroke piston

engines. A second class of internal combustion engines uses continuous combustion: gas turbines, jet engines and most rocket engines.

Kilowatt-hour (kWh): A unit of energy equal to one kW applied for one hour; running a one kW hair dryer for one hour would dissipate one kWh of electrical energy as heat. Also, one kWh is equivalent to one thousand watt hours.

Kilowatt (kW): One thousand watts of electricity (See Watt).

Load (Electric): Amount of electricity required to meet customer demand at any given time.

MCF: One thousand cubic feet.

Megawatt (MW): One million watts of electricity (See Watt).

Mining: An energy-consuming subsector of the industrial sector that consists of all facilities and equipment used to extract energy and mineral resources.

Nameplate Capacity: The maximum rated output of an electric power production unit (i.e. generator, prime mover) under specific conditions designated by the manufacturer. Capacity is usually indicated on a nameplate physically attached to the generator.

Natural Gas: Gas in place at the time that a reservoir was converted to use as an underground storage reservoir in contrast to injected gas volumes.

Net Capacity: The maximum load that an electrical apparatus (i.e. generating unit or station) can carry, not including use by the electrical apparatus.

Net Domestic Disposition: The total amount of energy produced in the domestic region that is available for sale within the domestic region, i.e. not including energy use by producers or energy exported for sale outside of the domestic region.

Net Extraction: The total amount of fuel obtained or produced by a power production plant, not including electric energy use by the plants.

Net Generation: The amount of gross generation not including the electrical energy consumed at the generating station(s) for station service or auxiliaries. Note: Electricity required for pumping at pumped-storage plants is regarded as electricity for station service and is deducted from gross generation.

Oil: A mixture of hydrocarbons usually existing in the liquid state in natural underground pools or reservoirs. Gas is often found in association with oil (See Petroleum).

O&M: Operations and maintenance

Other: The "other" category is defined as representing electricity consumers not elsewhere classified. This category includes public street and highway lighting service, public authority service to public authorities, railroad and railway service, and interdepartmental services.

Peak: The amount of electricity required to meet customer demand at its highest. The summer peak period begins June 1st and ends September 30th, and the winter peak period begins December 1st and ends March 31st.

Petroleum: A broadly defined class of liquid hydrocarbon mixtures. Included are crude oil, lease condensate, unfinished oils, refined products obtained from the processing of crude oil, and natural gas plant liquids. Note: Volumes of finished petroleum products include non-hydrocarbon compounds, such as additives and detergents, after they have been blended into the products.

Petroleum Products: Petroleum products are obtained from the processing of crude oil (including lease condensate), natural gas, and other hydrocarbon compounds. Petroleum products include unfinished oils, liquefied petroleum gases, pentanes plus, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, petrochemical feedstocks, special naphthas, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products

Plant: A term commonly used either as a synonym for an industrial establishment or a generating facility or to refer to a particular process within an establishment.

Power: The rate of producing, transferring, or using energy that is capable of doing work, most commonly associated with electricity. Power is measured in watts and often expressed in kilowatts (kW) or megawatts (MW).

Power Cost Equalization Program (PCE): Participating utilities receive state funding to reduce the charge to consumers in rural areas where prices can be three to five times higher than prices in urban areas.

Prime Mover: The engine, turbine, water wheel, or similar machine that drives an electric generator; or, for reporting purposes, a device that converts energy to electricity directly (e.g. photovoltaic solar and fuel cells).

Prime Mover Code	Prime Mover Description (U.S. EIA)
ST……..	Steam Turbine, including nuclear, geothermal and solar steam (does not include combined cycle)
GT……..	Combustion (Gas) Turbine (includes jet engine design)
IC……..	Internal Combustion Engine (diesel, piston)
CA……..	Combined Cycle Steam Part
CT……..	Combined Cycle Combustion Turbine Part
CS……..	Combined Cycle Single Shaft (combustion turbine and steam turbine share a single generator)
CC……..	Combined Cycle - Total Unit
HY……..	Hydraulic Turbine (includes turbines associated with delivery of water by pipeline)
PS……..	Hydraulic Turbine – Reversible (pumped storage)
BT……..	Turbines used in a binary cycle such as geothermal
PV……..	Photovoltaic
WT……..	Wind Turbine
CE……..	Compressed Air Energy Storage
FC……..	Fuel Cell
OT……..	Other
NA……..	Unknown at this time (use only for plants/generators in planning stage)

Pro Forma: A Latin term means "for the sake of form," it describes a method of calculating financial results in order to emphasize either current or projected figures.

Purchased Capacity: The amount of energy and capacity available for purchase from outside the system.

Railbelt: The portion of Alaska that is near the Alaska Railroad, generally including Fairbanks, Anchorage, the communities between these two cities, and the Kenai Peninsula.

Refinery: An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and oxygenates.

Reinjected: The forcing of gas under pressure into an oil reservoir in an attempt to increase recovery.

Renewable Energy Fund (REF): Established by the Alaska State Legislature and administered by the Alaska Energy Authority to competitively award grants to qualified applicants for renewable energy projects.

Renewable Energy Resources: Energy resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

Residential Sector: An energy-consuming sector that consists of living quarters for private households. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances. The residential sector excludes institutional living quarters.

Residual Fuel Oil: A general classification for the heavier oils that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations. It is used in steam-powered vessels in government service and inshore power plants, and can be issued for the production of electric power, space heating, vessel bunkering, and various industrial purposes.

Revenue (Electricity): The total amount of money received by an entity from sales of its products and/or services; gains from the sales or exchanges of assets, interest, and dividends earned on investments; and other increases in the owner's equity, except those arising from capital adjustments.

Short Ton: A unit of weight equal to 2,000 pounds.

Space Heating: The use of energy to generate heat for warmth in housing units using space-heating equipment. It does not include the use of energy to operate appliances (such as lights, televisions, and refrigerators) that give off heat as a byproduct.

Steam: Water in vapor form; used as the working fluid in steam turbines and some heating systems.

Transmission System (Electric): An interconnected group of electric transmission lines and associated equipment for moving or transferring electric energy in bulk between points of supply and points at which it is transformed for delivery over the distribution system lines to consumers, or is delivered to other electric systems.

Tonne (Ton): A unit of mass equal to 1,000 kilograms or 2,204.6 pounds, also known as a metric ton.

Total Disposition: The total amount of sold or transferred energy.

Turbine: A machine for generating rotary mechanical power from the energy of a moving force (such as water, hot gas, wind, or steam). Turbines convert the kinetic energy to mechanical energy through the principles of impulse and reaction, or a mixture of the two.

U.S. Department of Energy (DOE): Oversees programs, such as Wind Powering America, with the mission to advance national, economic, and energy security; promote innovation; and ensure environmental responsibility. http://www.energy.gov/

Watt (Electric): The electrical unit of power. The rate of energy transfer equivalent to one ampere of electric current flowing under a pressure of one volt at unity power factor.

Watt (Thermal): A unit of power in the metric system, expressed in terms of energy per second, equal to the work done at a rate of one joule per second.

Watt hour (Wh): The electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electric circuit steadily for one hour.

Appendix B. Maps of Energy Regions

Figure 1. Alaska Energy Statistics 2003 Regions

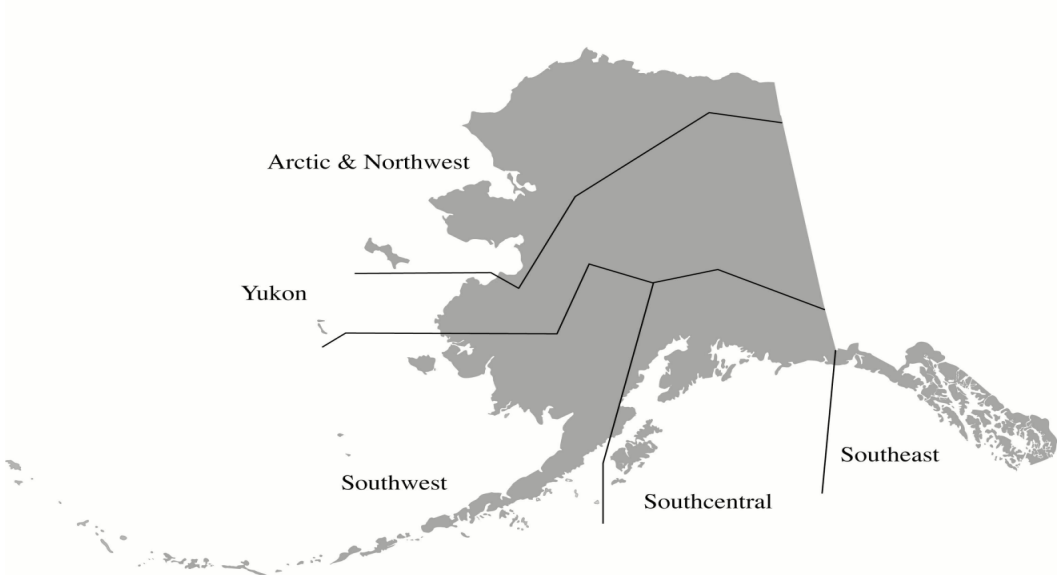
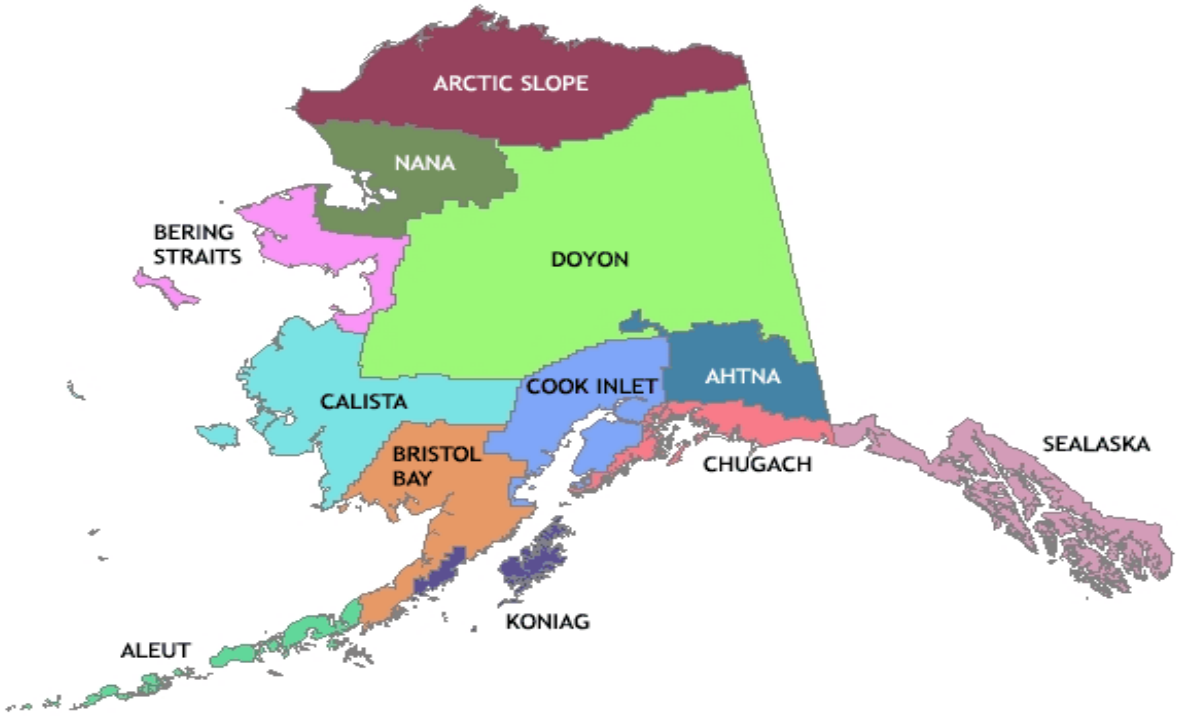


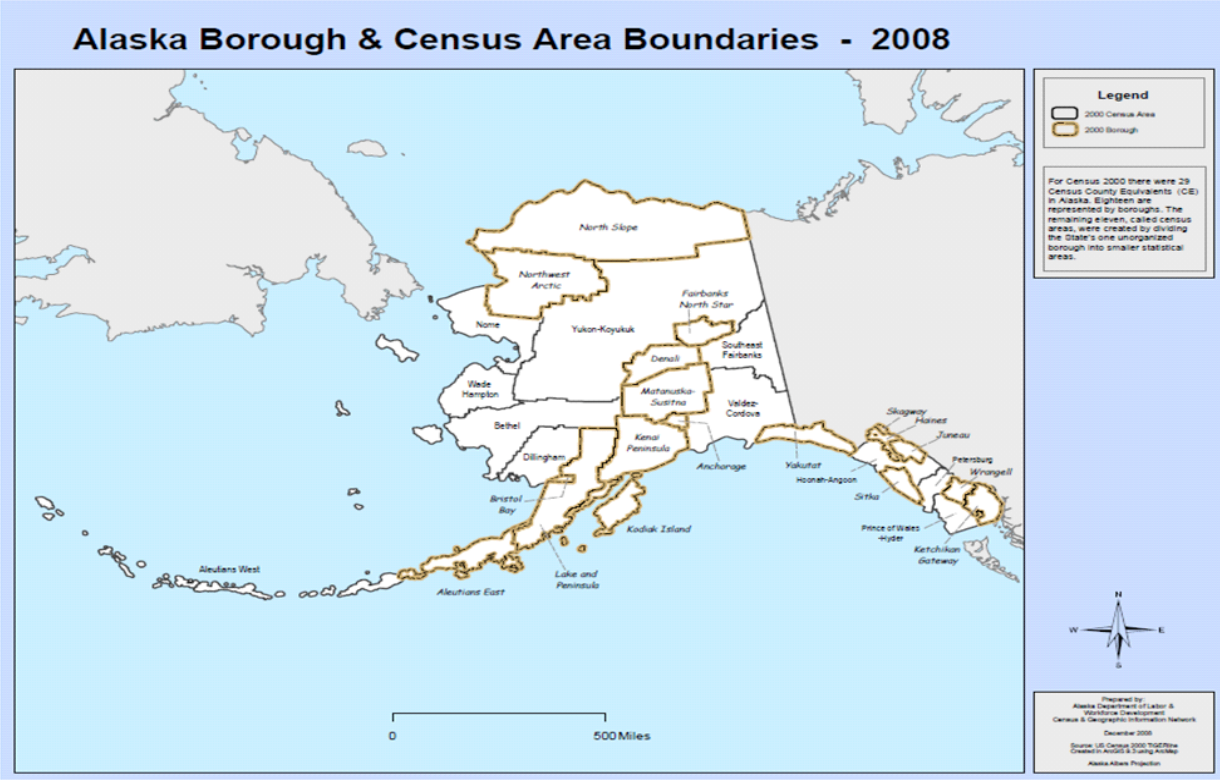
Figure 2. Native Corporation Regions



Source: First Alaskans Institute

Fay, Ginny, Alejandra Villalobos Meléndez and Amber Converse, 2011, *Alaska Energy Statistics*, 1960-2009, prepared for the Alaska Energy Authority, September 2011

Figure 3. Alaska Census Area Map



Source: 2000 Census, Alaska Department of Labor and Workforce Development

Figure 4. Alaska Energy Regions Map

Source: Alaska Energy Authority

Fay, Ginny, Alejandra Villalobos Meléndez and Amber Converse, 2011, *Alaska Energy Statistics*, 1960-2009, prepared for the Alaska Energy Authority, September 2011

Appendix C. Data Sources for Electric Energy Statistics

The primary data source for the electric power statistics are the U.S. Department of Energy (DOE), Energy Information Administration (EIA) and the Alaska Energy Authority, Power Cost Equalization program data. Every utility and industrial (including military) electrical generating facility with a capacity greater than one megawatt is required to report their operating characteristics to the EIA annually, and in some instances, monthly. This information is compiled by the EIA and is available for every generating facility on their website: (http://www.eia.doe.gov/). We obtained data for the year 2009. The forms of interest to compile this publication are the EIA 860, 861 and 923. These are reporting forms for capacity, generation, sales and revenues.

The use of the EIA database is a continuation of the methodology used in the 2008 and 2003 *Alaska Electric Power Statistics* update. Before the 2003 update, the report's primary data source was a questionnaire sent to each Alaska utility and industrial facility. There were several reasons to use the federal database for this report rather than a survey. First, most utilities and industrial facilities are required by law to report to the federal government each year on their activities using the EIA forms. Since this information for each utility is available on the EIA website, it is redundant to collect the same information through a second questionnaire. It is also considerably less expensive to collect the data from the EIA website than to collect it through a mail-out survey. Furthermore, using the EIA data reduces the reporting burden placed on the utilities and industrial producers of electricity. Finally, respondents are required by law to report to the EIA and this should make the response rate high. In addition, obtaining generating characteristics from a single source helps to insure consistency between federal and state reports.

Nonetheless, using EIA data poses some challenges because not all information reported in this publication is collected via the EIA forms. First, the smallest utilities with installed capacity less than one megawatt, are not required to report to EIA and are not included in the EIA database. Second, not all Alaska generating facilities report as required by law.

Data collected in the forms are available in sets of databases that may present portions of the data differently. For instance, some data may be available at the utility level only, while other data may be at the facility and/or generator level. The forms are processed by different departments within EIA and may have differences in the underlying definition of the data making reconciliation of the information in the datasets within forms, and across the different forms sometimes difficult. Finally, the lag time for the availability of the federal data is approximately two years.

To supplement missing data we used the database for the annual Power Cost Equalization Reports by the Alaska Energy Authority (AEA). Also, as needed, the Alaska Energy Authority and ISER supplemented these data sources by contacting utilities directly.

These data sources allowed us to collect information for almost all the utilities in the state without incurring the considerable cost of conducting a complete census of all producers. A few of the smallest utilities that were not either in the EIA database or the Power Cost Equalization database did not provide information for this report.

The 2009 Power Cost Equalization data provided data on the generation and sales (residential and commercial) of all utilities participating in the Power Cost Equalization program, including a breakdown by community for those utilities that operate in multiple communities, such as Alaska Village Electric Cooperative (AVEC) and Alaska Power and Telephone (AP&T). The EIA data for these utilities was in some cases reported only as a total across all communities, and we used this as control totals. AEA, AVEC, AP&T and NSPL provided helpful assistance in supplying installed capacity information for each plant not originally included in the PCE database. In this case we were able to publish information taken directly from the utility reflecting statistics from each of its serviced communities.

The PCE database contains information collected through AEA's PCE Utility Monthly Report which PCE participants must file. Utilities also report to the RCA annually for fuel cost adjustments. Reporting to both entities should be consistent, however discrepancies are not unusual. These discrepancies may be due to high turnover in small utilities, poor reporting and limited staff to verify the utilities' self reported data.

In addition, there are data (energy loss, use by facility and energy provided without charges) that is not included in the PCE report. Because of this, the values found in table 2.2a may not reflect a summation of all AP&T communities as reported in the PCE report. Rather they reflect what was reported to the EIA directly as prepared by the utility itself. This same methodology was implemented in the sales and revenues tables (2.4a) when deemed appropriate. The intent is to create as comprehensive of a table as possible.

The summary information in the historical tables was calculated from the same sources mentioned above. Data from these sources was calculated and re-formatted where appropriate and consolidated into master data files from which all the tables in this report where built. Inevitably the use of multiple data sources introduces some inconsistencies in reporting. Notwithstanding, we believe that the *Alaska Electric Power Statistics* 2010 update report provides useful information on the state of electric power generation in Alaska.

Appendix D. Reporting Requirements

Energy Information Administration

Every utility facility with a capacity greater than one megawatt (MW) is required to report their operating characteristics to the US Department of Energy (DOE), Energy Information Administration (EIA) annually, and in some instances, monthly. This information is compiled by the EIA and is available for every generating facility on their website (http://www.eia.doe.gov/). Specific reporting requirements are determined by the Department of Energy but collected, assembled, and evaluated by the EIA according to the Federal Energy Administration Act of 1974. We obtained data for year 2009. Three EIA forms were used in this report:

- **EIA-860 Annual Electric Generator Report**. This report contains information on capacity and types of fuel used. It is completed by all existing plants and proposed (5-year plans) plants that: 1) have a total generator nameplate capacity (sum for all generators at a single site) of one MW or greater; and 2) where the plant is connected to the local or regional electric power grid and has the ability to draw power from the grid or deliver power to the grid.

- **EIA -860M Monthly Update to the Annual Electric Generator Report**. This report contains monthly updates to the EIA-860. It is completed by those who also completed EIA-860 and additionally indicated a proposed change in generator production within one month of the report period. The proposed change may be due to: 1) a new generator scheduled to start commercial operation; 2) an existing generator scheduled to retire from service; or 3) an existing generator with a proposed modification scheduled.

- **EIA-861 Annual Electric Power Industry Report**. This report contains information on peak production, net generation, sales, and revenues. It is completed by electric industry distributors including: electric utilities, wholesale power marketers (registered with the Federal Energy Regulatory Commission), energy service providers (registered with the Regulatory Commission of Alaska), and electric power producers.

- **EIA-923 Power Plant Operations Report**. Since the 2003 production of this report, EIA has changed some forms. The data collected in Forms 906 and 920 have been combined and are now reported in form 923. This report contains information on electric power generation, fuel consumption, fossil fuel stocks, and fossil fuel cost and quality. It is completed by all electric power plants that: 1) have a total generator nameplate capacity (sum for generators at a single site) of one MW or greater; and 2) where the plant is connected to the local or regional electric power grid and has the ability to draw power from the grid or deliver power to the grid.

Power Cost Equalization Program and Regulatory Commission of Alaska

Participants of the Power Cost Equalization (PCE) program report to the Regulatory Commission of Alaska (RCA) for fuel cost adjustments to their rates. The RCA has authority to maintain accounts and records of public utilities that fall under its jurisdiction, under Alaska Statute 42.05.451. This responsibility allows the Regulatory Commission of Alaska to obtain information from regulated utilities. Additionally, all utilities that serve ten or more customers must obtain an operating certificate, which describes the authorized service area and scope of operations of the utility. The RCA will issue a certificate when it finds the utility to be fit, willing, and able to provide the service. The RCA maintains a list of both regulated and unregulated certified utilities. Utilities report annually to the RCA, but file a PCE Utility Monthly Report with AEA.